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Variability in the inshore cod fishery of Labrador and eastern Newfoundland

by

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Abstract

The annual catches of cod from the inshore fishery of Newfoundland-Labrador have been highly variable in the past 100 years. The reasons for these fluctuations are not clear but are likely to be various and include environmental, economic and other factors caused by local and global events. Anecdotal information on cod availability and abundance suggests that cod show variable patterns of abundance along the coast. Recaptures of cod tagged near the coast of Newfoundland during June 1984, 1985, and 1986 indicate that there are local variations in proportions of cod which migrate during summer into the shallow water zone from the different concentrations off the coast.

Résumé

Les prises annuelles de morue par la pêche côtière dans la région de Terre-Neuve-Labrador ont été très variables au cours des 100 dernières années. Les causes de ces fluctuations ne sont pas claires, mais il est probable qu'elles soient multiples et qu'elles soient liées à des facteurs environnementaux, économiques et autres qui sont eux-mêmes liées à des événements locaux et planétaires. Les données anecdotiques sur la disponibilité et l'abondance de la morue laissent entendre que l'abondance de la morue varie le long de la côte. La capture de morues marquées près de la côte de Terre-Neuve au cours des mois de juin 1984, 1985 et 1986 indique des variations locales dans les proportions de morues qui migrent durant l'été dans la zone des eaux peu profondes à partir des différentes zones de concentration au large de la côte.

I. Annual variability of historical inshore catches of cod based upon export figures

The annual catches of cod from the inshore fishery of Newfoundland-Labrador during the past 100 years have been highly variable. Catches during 1890-1940 were obtained on an annual basis from export figures and from Fisheries Reports in the Journals of the House of Assembly. The estimates of Labrador and insular Newfoundland are based upon general observations by Gosling (1910), Browne (1909), Hatton and Harvey (1883), Packard (1891) and Prowse (1895) and from Annual Reports of the Department of Marine and Fisheries. Conversions to round weight were made using conversion factors presented in NAFO SCS Doc. 80/VI/6. These crude estimates are intended only to give a general impression of the degree of variability of the inshore cod fishery in NAFO Div. 2G, 2H, 2J, 3K, and 3L. Within a decade (e.g. 1910-19), the range of annual catch as deduced from exports is about 100,000 t (Fig. 1). The catches in the 1910-19 decade varied from a low of 179,000 t in 1915 to a high of 336,000 t in 1917. Similar ranges are exhibited in other decades with the exception of 1960-69 when catches were smaller and the range decreased (Table 1) although the proportional change remains about the same. The reasons for these fluctuations are not at present clear but are likely to be various and include environmental, economic and other factors (see Lear et al. 1986).

II. Anecdotal information on cod abundance during 1910-19

The Journals of the House of Assembly of Newfoundland generally contain Annual Reports of the Department of Marine and Fisheries. These reports were generally overviews of the various fisheries for the preceding year and contain anecdotal information on various sections of the coast where cod were plentiful and where they were scarce. These anecdotal reports are therefore independent of market and economic conditions and in general are a reflection of the abundance and availability of cod on various sections of the coast.

The decade of 1910-19 has been singled out to illustrate the annual variability in inshore catch for the following reasons:

1) 1917 was a year of record catch (estimated at 336,000 t) in inshore 2G, 2H, 2J, 3K, and 3L.

2) There was no offshore cod fishery north of the Grand Bank.

3) No commercial fishery for capelin existed.

4) The gears employed were passive, for example, cod trap, line trawl, gillnet, handline, and jigger.

5) There were no regulatory constraints on effort or catch.

In most years, according to these reports, cod failed to appear or appeared in less than average quantities along some section of the coast.

In Labrador, in 1910, the fishery started in May (the earliest on record up to then) but was the worst fishery on record. In 1911, the Labrador catch was below average but above the 1910 catch. The fishery from Cape Race to Lamaline was a blank from June to October 1, but fish were plentiful from October to November. In 1912, there was a good fishery overall. In 1913, the cod trap fishery was a failure in northern and eastern Newfoundland while from Cape St. Francis to the southeast side of St. Mary's Bay the cod trap fishery was fairly good.

In 1914, the cod trap fishery was almost a complete failure in Notre Dame and White bays while the fishery in Labrador was excellent. The catch in 1915 was fair although it was generally good in Labrador. The fishery in 1916 was good for cod traps in eastern Newfoundland as far north as Fogo but from Fogo north the trap fishery was considerably below average. The year 1917 was a banner year with an excellent catch all around except that the cod didn't migrate into the deep-water bays. The fish were obtained only at headlands and in the outer portions of the coast. In spite of the lack of migration into the bays, this was one of the best all around catches that Newfoundland ever recorded up to 1917.

In 1918, an excellent overall catch was obtained but the catch from Bonavista Bay to White Bay was below average. In 1919, the cod trap fishery from Cape Race to Bonavista was below average while that in Conception Bay was exceptionally poor. The fishery in Labrador was successful.

What was true of the decade 1910-19 was equally true for other decades, emphasizing the great variability in abundance and/or availability of cod to the inshore fisheries of Labrador and eastern Newfoundland.

III. Variability of the inshore migration of cod tagged near the coast during June, 1984, 1985, and 1986

During June 1984-86 about 11,000 cod (larger than 45 cm in length) were tagged off the east coast of Newfoundland (Fig. 2, Table 2) prior to the inshore migration. The catching, handling, tagging, and release procedures and the types of tags were as reported in Lear (1984).

Cape Bonavista, 1984 (Experiment 49)

Of the 3391 cod tagged off Cape Bonavista during June 5-8, 1984 about 10.5% were recaptured by inshore fixed gears during June-December 1984. When adjustments were made for tagging mortality and reporting rates, the proportion harvested inshore was calculated as 16.5%. About 48% of these inshore recaptures were caught in the deep water (over 200 m) below the cold intermediate layer of the Labrador current throughout the summer and autumn of 1984. No cod were caught in the intermediate depths (100-200 m) of the cold core of the Labrador Current (Table 2).

Cape Bonavista, 1985 (Experiment 55)

From 2159 cod tagged during June 9-12, 1985 off Cape Bonavista, about 10.7% (adjusted = 17.0%) were recaptured by inshore fixed gears. Of these about 59% were recaptured in the deep water (over 200 m) during the summer and autumn of 1985.

Central Grand Bank 1985 (Experiment 54)

Only 3.3% (adjusted = 5.3%) of 1033 cod tagged on the Central Grand Bank during June 2-3, 1985 were recaptured inshore.

Off Fogo 1985 (Experiment 56)

A more direct comparison with the tagging off Cape Bonavista for 1985 is that off Fogo during June 14-15, 1985. Of 1972 cod tagged only 4.6% (adjusted = 7.4%) were recaptured by inshore fixed gears. This indicates either a lower migration factor than that for the concentration tagged off Cape Bonavista or a lower level of effort was exerted on this concentration than that for the cod from the Cape Bonavista tagging.

Grey Islands and SW Funk Island Bank 1986 (Experiment 67 + 68)

During June 13-15 1986, 2982 cod were tagged from a large concentration southeast of the Grey Islands. To date there have been 12.6% (adjusted = 20.1%) of these tags returned from the inshore fishery from Cape Bauld to Fogo.

During June 19-20, 1986, 697 cod were tagged from a small concentration east of Funk Island and on the shallow area (about 220 m depth) of the southwestern Funk Island Bank. To date there have been 13 tags returned inshore; (1.9%, 3.0% adjusted) from this tagging which is significantly lower ($x^2 = 69.5$; $P < .001$) than the recapture rate from cod tagged off the Grey Islands. On the Funk Island Bank the bottom temperature was about 2°C and there was very little cold water in the intermediate depths to prevent cod from ascending in the water column. Capelin were present in large schools throughout the water column and the cod were feeding heavily on the capelin.

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Table 1. Historical catches of cod from NAFO Divisions 2J3KL for the years 1959-85 (from Baird and Bishop 1986).

	2J			3K			3L			2J3KL Offshore Not	Total	Total		
		Offshore			Offshore			Offshore						
Year	Inshore	Can.	Other	Inshore	Can.	Other	Inshore	Can.	Other	Specified	Inshore	Offshore	Total	TAC
1959	17533	-	39405	56264	-	83003	85695	4515	43097	30060	159492	200080	359572	-
1960	15418	1	164036	47676	53	69855	94192	7355	60213	-	157286	301513	458799	-
1961	17545	1	243144	31159	-	60574	70659	4675	70318	3	119363	378715	498078	-
1962	23424	-	226841	42816	-	45554	72271	4383	87463	-	138511	364241	502752	-
1963	23767	1	187925	47486	-	75344	73295	4446	78620	9020	144548	355356	499904	-
1964	14787	13	180232	40705	30	110887	75806	10158	129135	41832	131298	472287	603585	-
1965	25117	-	227206	26467	21	46146	58943	7353	119529	44872	110527	445127	555654	-
1966	22645	39	221004	32208	13	57543	55990	8253	117231	7381	110843	411464	522307	-
1967	27721	28	212327	24905	114	76900	49233	13478	195494	10335	101859	508676	610535	-
1968	12937	4592	323280	40768	1849	114123	47330	15784	202998	43809	101035	706435	807470	-
1969	4328	30	356543	24923	56	74397	67973	18255	142954	58974	97224	651209	748433	-
1970	1963	-	196823	21511	93	69396	53113	14471	128975	29868	76587	439626	516213	-
1971	3229	84	146903	21111	31	58404	38115	11976	140664	11979	62455	370041	432496	-
1972	1725	-	148038	14054	7	132122	46273	4380	107991	3580	62052	396118	458170	-
1973	3619	1123	52985	13190	110	159651	24839	1258	97734	-	41648	312861	354509	666000
1974	1804	-	119463	10747	19	149189	22630	880	67918	-	35181	337469	372650	657000
1975	3000	410	78578	15518	13	112854	22695	670	53770	-	41213	246295	287508	554000
1976	3851	94	30691	20879	646	79665	35209	2187	40998	-	59939	154281	214220	300000
1977	3523	525	39584	28818	1039	26788	40282	5362	26799	-	72623	100097	172720	160000
1978	6638	4682	17546	29623	5859	7541	45194	9213	12263	-	81455	57104	138559	135000
1979	8445	9194	6536	27018	15190	23275	50359	14184	12690	-	85822	81069	166891	180000
1980	17210	13592	7435	37015	21920	6828	42298	15523	13961	-	96523	79259	175782	180000
1981	11582	24794	4760	22770	23344	3847	42835	21746	15070	-	77187	93561	170748	200000
1982	15330	57483	8923	42410	8614	4072	57881	25788	9273	-	115621	114153	229774	230000
1983	10638	37341	3640	40803	31565	2352	54683	39423	9768	-	106124	124089	230213	260000
1984	12772	10994	1523	35100	47866	10127	49428	49603	12974	-	97300	133087	230387	266000
1985*	9267	1628	10	30263	69244	8698	38782	38197	34359	-	78312	152136	230448	266000

*Figures for 1985 revised from Baird and Bishop, 1986.

Table 2. Numbers of cod tagged, numbers of reported recaptures in various depth zones inshore in the year of tagging, proportions reported of numbers tagged and proportions of estimated recaptures inshore of numbers estimated to have survived tagging.

Expt. no.	Area	Date tagged	No. tagged	Inshore recapture			Inshore total	% Inshore	Adjusted % inshore
				100 m	100-200 m	200 m			
49	Cape Bonavista	June 5-8, 1984	3391	183	0	168	351	10.4	16.5
54	Central Grand Bank	June 2-3, 1985	1033	31	0	3	34	3.3	5.3
55	Cape Bonavista	June 9-12, 1985	2159	93	2	135	230	10.7	17.0
56	Fogo	June 14-15, 1985	972	41	0	4	45	4.6	7.4
67	Grey Islands	June 13-15, 1986	2982	332	4	39	375	12.6	20.1
68	SW Funk Is. Bank	June 19-20, 1986	697	10	0	3	13	1.9	3.0

Estimated proportion surviving tagging = 0.87.

Estimated proportion of recaptures reported = 0.72.

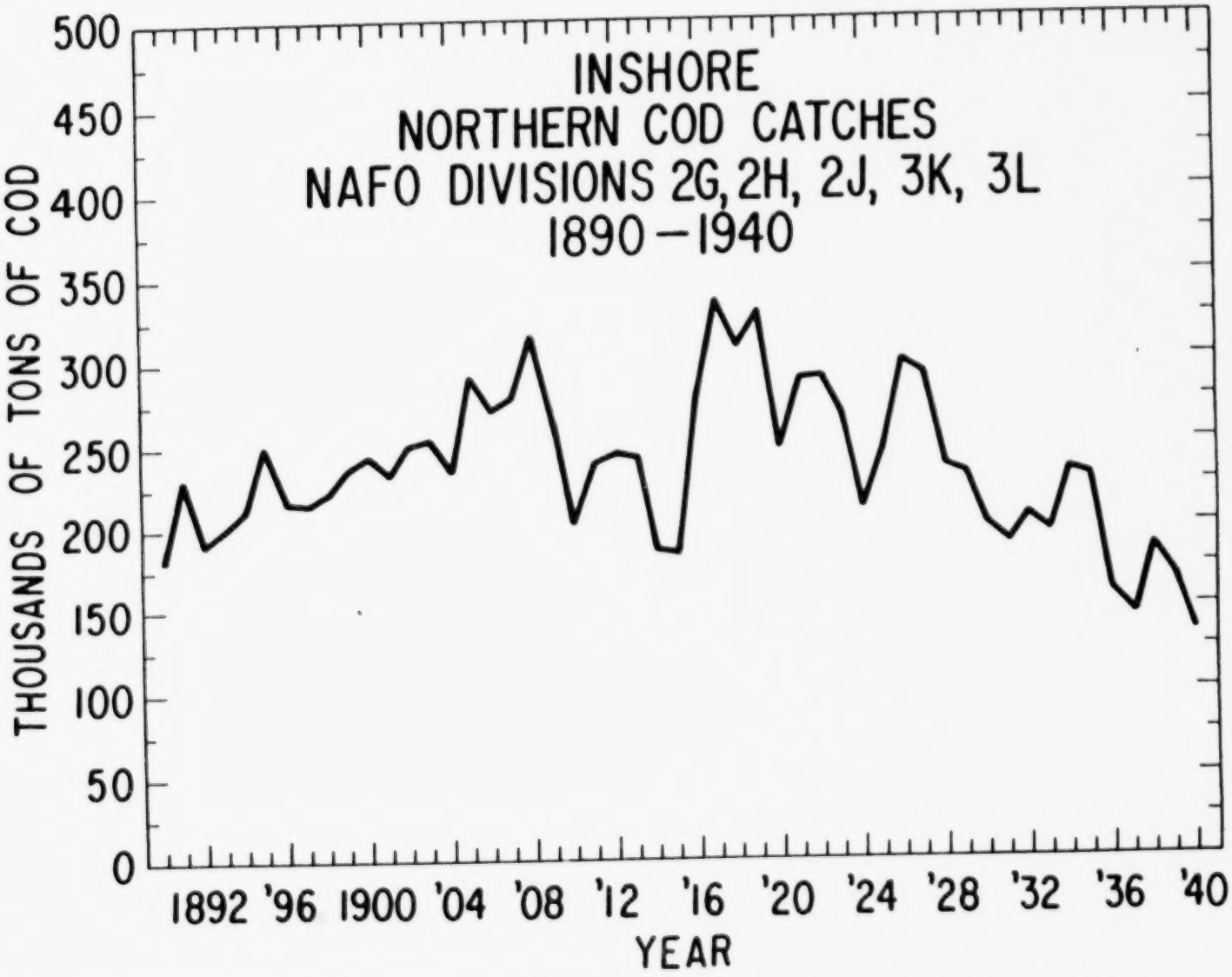
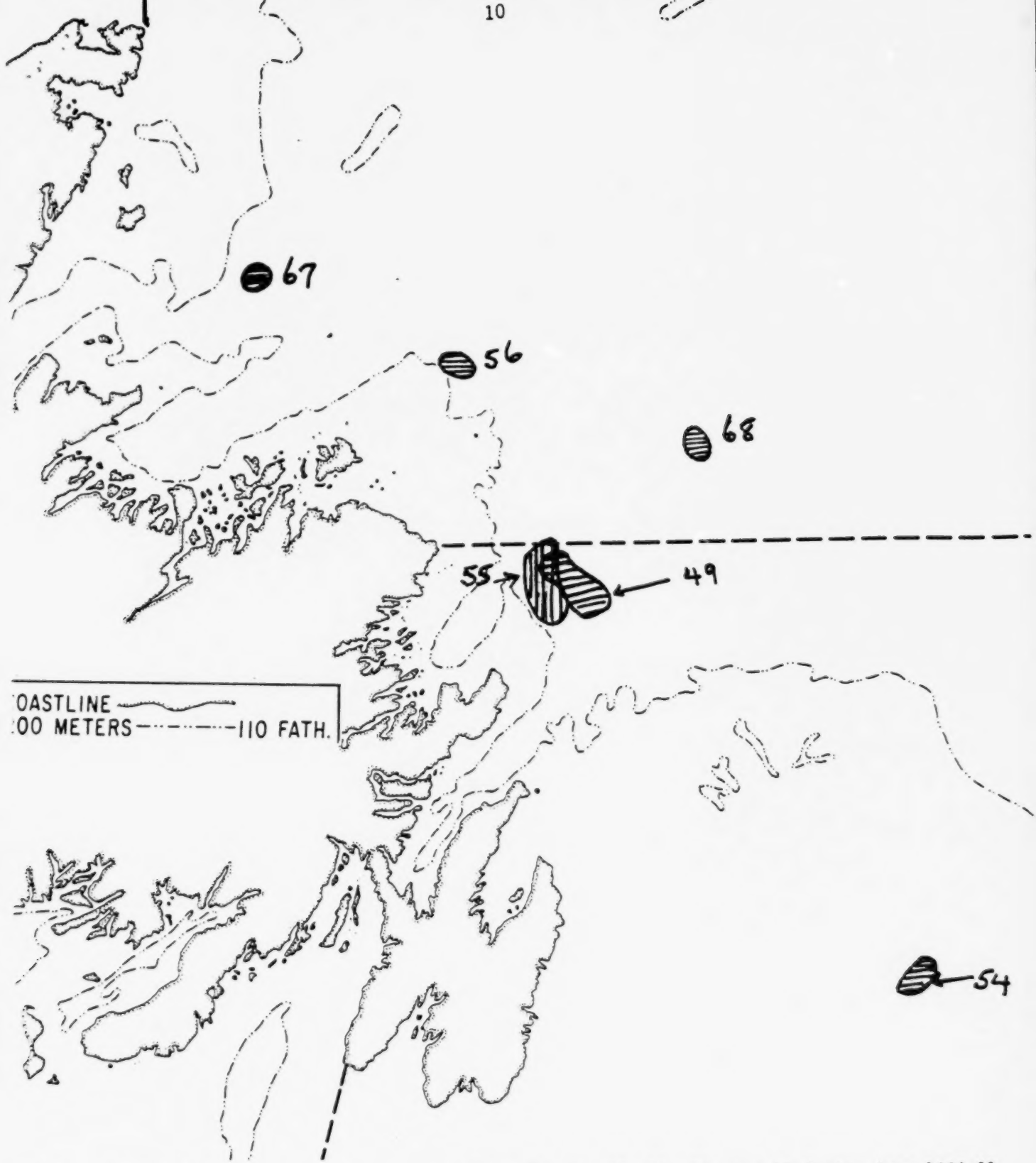


Fig. 1. Inshore catches of cod from coastal Labrador (NAFO Divisions 2G, 2H and 2J) and eastern Newfoundland (NAFO Divisions 3K and 3L) during 1890-1940.



ig. 2. Tagging locations of cod for experiments 49, 54, 55, 56, 67, and 68 during June 1984-86.